

Space Weather Technical Forecast

Issued on Friday, 08 July 2022 at 01:16 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: G1/Minor Geomagnetic Storms likely Day 1 (8th July), with risk decreasing through the period. Slight chance of R1-R2 radio blackouts.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low, with only one minor C-class flare. This was emitted from new region AR3055 in the southeast quadrant, which is currently classified as Dao/beta. However, AR3053 remains the largest region on the visible disc. The remaining four sunspot regions are small, simple and relatively stable. No Earth-directed CMEs have been observed in available imagery over the past 24 hours.

Solar Wind / Geomagnetic Activity: The solar wind, as observed at L1 by DSCOVR, showed a weak CME arrival, starting around 07/0600 UTC, perhaps combined with the onset of a weak HSS from CH97/+. Wind speed was initially ambient around 310 km/s, but saw a step-wise increase from 07/0600 UTC, peaking at 438 km/s at 07/1432 UTC, and is currently around 380 km/s. The density started slightly above average, but jumped after 07/0600 UTC peaking well above average at 55 ppcc. The IMF was initially weak, but jumped briefly to moderate levels around 07/0810 UTC, before becoming strong from 07/1045 UTC. The Bz was weakly negative until 07/1100 UTC, then became moderate or strongly negative, with a peak of -19nT at 07/1342 UTC. The phi angle was positive (away from the Sun) at first, but became more variable from 07/0600 UTC, then positive after 07/1113 UTC. Geomagnetic activity was Quiet (Kp 0-2) at first, increasing Unsettled to Active (Kp 3-4) from 07/1200 UTC, with a G1/Minor Storm (Kp 5) interval 07/1200-1500UTC.

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV), as measured by GOES-16, remained at background levels throughout the period. The high energy electron flux (greater than 2MeV) has been at background to moderate levels through the last 24 hours, peaking at 188 pfu at 07/0250 UTC. Electron fluence was well below the Active (1e8 integrated pfu) threshold, with a decreasing trend. Observed fluence was 1.53e6 integrated pfu at 08/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to remain Low, with a Slight Chance of isolated M-class flares. An increase is possible from day 3 (10th) as returning regions potentially rotate onto the eastern limb.

Solar Wind / Geomagnetic Activity: Earth may experience a glancing blow from a CME which occurred on 05 July from AR3047. This CME was difficult to assess but it gave a faint partial halo in SOHO imagery and as such a low confidence glancing blow is possible today (8th July). Otherwise it appears that Earth has recently experienced a weak CME arrival, combined with the onset of a weak HSS from CH97/+.

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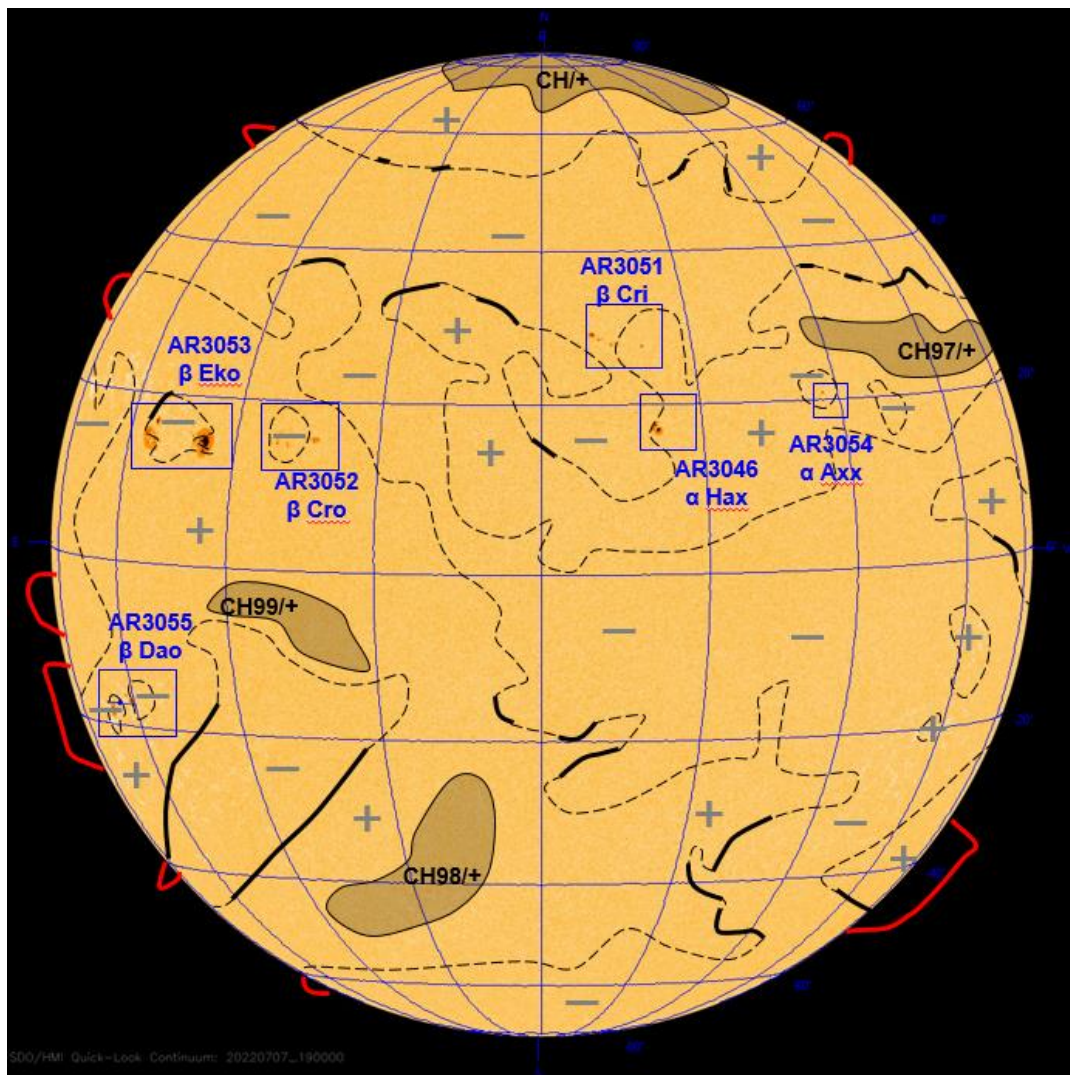
The solar wind is expected to be at background to slightly elevated levels, with a chance of temporarily reaching elevated levels today if the CME arrives.

Geomagnetic activity is expected to be Unsettled to Active (Kp 3-4) with G1/Minor Storm (Kp 5) intervals likely today (8th July) due to combined HSS and CME effects. Activity should decline tomorrow (9th) to become mainly Quiet (Kp 0-2) from Day 3 (10 July).

Energetic Particles / Solar Radiation: In the absence of any significant sunspot development, the high energy proton flux (greater than 10 MeV) is likely to remain at background levels. Probabilities increase very slightly as AR3053 moves towards centre disc.

The high energy electron flux (greater than 2MeV) may increase through this period, however confidence is low. This may result in a gradual increasing trend in the electron fluence, but if this occurs the fluence is still expected to remain below the Active threshold.

Figure 1. Solar Analysis Valid 07/1900 UTC.



Key: Filament —, Prominence —, Magnetic Field Line - - -, Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α - β - γ - δ and Zurich-McIntosh Axx etc.

Geomagnetic Storms:

Earth may experience a glancing blow from a CME which occurred at 05/0407 UTC from AR3047. This CME was difficult to assess as it was faint and contaminated by a far sided CME which was visible at the same time. However, it gave a faint partial halo in SOHO imagery and as such a low confidence glancing blow is possible on today (8th July).

Otherwise, it appears that Earth has recently experienced a weak CME arrival, combined with the onset of a weak HSS from CH97/+. Over the next four days the solar wind is expected to be at background to slightly elevated levels, with a chance of temporarily reaching elevated levels today if the CME arrives.

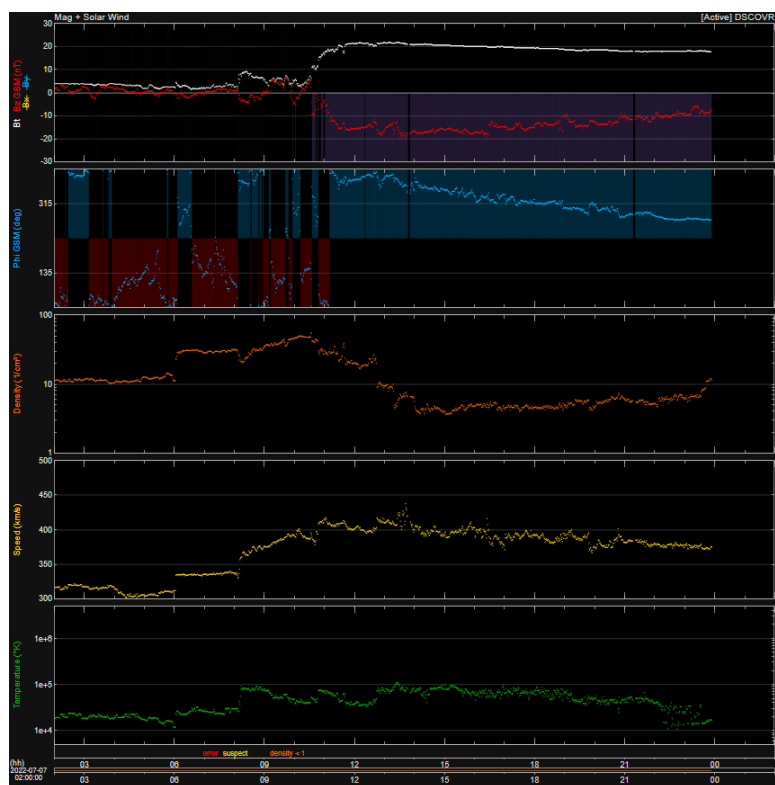
Geomagnetic activity is expected to be Unsettled to Active (Kp 3-4) with G1/Minor Storm (Kp 5) intervals likely today (8th July) due to combined HSS and CME effects. Activity should decline tomorrow (9th) to become mainly Quiet (Kp 0-2) from Day 3 (10 July).

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	Yes	60	20	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
05/0934	Partial	AR3047	SW quadrant	530 km/s	08/1200	Low confidence – glancing blow possible.

Figure 2: Solar wind parameters from DSCOVR from the past 24 hours.



Radio Blackouts - X-Ray Flares:

There are currently six numbered sunspot regions on the visible disc. AR3053 is the largest region, and has increased slightly in area, but currently appears to be reasonably straightforward magnetically. The new region in the far southeast has been numbered as AR3055, appears relatively magnetically simple, has increased in size recently, and produced some minor flare activity earlier yesterday. The other regions are relatively simple and stable, although AR3051 has gained some small intermediate spots.

Later in the period new regions may rotate onto the eastern limb, potentially increasing the probabilities of significant flares.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	20	20	20	20
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

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The high energy proton flux (greater than 10 MeV) is currently at background levels, and will most likely remain at this level through the period, in the absence of any significant sunspot development. A slight uptick in probability is suggested on Day 3 (10th July) as AR3053 reaches near centre disc.

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	2	2
Very Active	≥ S3 [*]	No	1	1	1	1

^{*} S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm⁻²sr⁻¹s⁻¹)

High Energy Electrons Event (≥ 2MeV):

The high energy electron flux (greater than 2MeV) is currently at background to moderate levels. Electron flux might increase through this period under the influence of a weak HSS. High (1000 pfu) flux levels may be reached during the diurnal maxima later in the period, but confidence is low. Electron fluence is currently well below the Active threshold. An upward trend is possible following the current weak coronal hole connection, but with low confidence for the magnitude of this. Currently the fluence is expected to remain below the Active threshold.

GEO Electron Environment	Level (cm ⁻² sr ⁻¹ day ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ 1x10 ⁸	No	1	10	10	20
Very Active	≥ 2 MeV ≥ 1x10 ⁹	No	1	1	1	1

Figure 3: Latest Met Office REFM model, which is considered to be giving good guidance.

